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level of the gustatory pore.——In the Annals of the New York Academy of Sciences, Mr. R. E. C. Stearns publishes a paper on the existence of a colony of *Helix aspersa* in California, which was planted twenty-three years ago at San José. He also remarks on the geographical distribution of certain West American land-snails, and corrects previous errors concerning them.——In *Nature*, Mr. W. A. Herdman collects the evidence brought forward by Charles Julien, which shows strong ground for the belief that the little understood " neural gland " in the Ascidians, represents the glandular portion of the *hypophysis cerebri*, or pituitary body of vertebrates.——At a recent meeting of the Royal Society of London, Professor W. K. Parker, in a paper on the structure and development of the skull in sturgeons, remarks in closing, that the sturgeons as a group cannot be said to lie directly between any one family of the Selachians and any one family of the bony Ganoids, yet, on the whole, that is their position; the bony Ganoids, on the whole, approach the Teleostei, especially such forms as Lepidosteus and Amia, which have lost their " spiracle," and in other points are less than typical, as Ganoids. Larval sturgeons are, in appearance, miniature sharks; for a few weeks they have a similar mouth, and their lips and throat are beset with true teeth that are molted before calcification has fairly set in. Their first gills are very long and exposed, but not nearly so long, or for such a time uncovered, as in the embryo of sharks and skates.

A CORRECTION.—On pp. 585 and 586 of the July NATURALIST, a serious inadvertency occurs. In the list of strictly fresh-water shells is mentioned *Helicina occulta* (by typographical error printed *oculata).* Though Helicina is not a pulmonate, the species here indicated is strictly terrestrial in its habit. The reader will therefore refer it to the preceding list of land shells, where the intention was to have placed it.—*R. Ellsworth Call.*

ENTOMOLOGY.[1]

THE CULTIVATION OF PYRETHRUM AND MANUFACTURE OF THE POWDER.[2]—*The use of Pyrethrum as an Insecticide.*—Up to a comparatively recent period the powder was applied to the destruction of those insects only which are troublesome in dwellings, and Mr. C. Willemot seems to have been the first in the year 1857 (?) to point out its value against insects injurious to agriculture and horticulture. He goes, however, too far in his praise of it, and some of his statements as to its efficacy are evidently not based upon actual experiment. Among others he proposes the following remedy: " In order to prevent the ravages of the weevil on wheat fields, the powder is mixed with the grain to be sown, in proportion of about ten ounces to about three bushels, which will save a year's crop." This is simply ridiculous, as every one who is familiar with the properties of Pyrethrum will understand. We have during the past three years largely experimented with it on many species of injurious insects, and fully appreciate its value as a general insecticide, which value has been greatly enhanced by the discovery that it can be most economically used in liquid solution; but we are far from considering it a universal remedy for all insects. No such universal remedy exists, and Pyrethrum has its disadvantages as has any other insecticide now in use. The following are its more serious disadvantages: 1. The action of the powder, in whatever form it may be applied, is not a permanent one in the open air. If, *e. g.*, it is applied to a plant, it immediately affects the insects on that plant with which it comes in contact, but it will prove perfectly harmless to all insects which come on to the plant half an hour (or even less) after the application; 2. The powder acts in the open air—unless, perhaps, applied in very large quantities—only upon actual contact with the insect: if *e. g.*, it is applied to the upper side of a cotton leaf the worms that may be on the underside are not affected by it; 3. It has no effect on insect eggs nor on pupæ that are in any way protected or hardened.

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[1] This department is edited by Professor C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

[2] Continued from July number.

These disadvantages render Pyrethrum in some respects inferior to arsenical poisons, but, on the other hand, it has the one overshadowing advantage that it is perfectly harmless to plants or to higher animals; and if the cultivation of the plant in this country should prove a success, and the price of the powder become low enough, the above mentioned disadvantages can be overcome, to a certain degree, by copious and repeated applications.

In a closed room the effect of Pyrethrum on insects is by far more powerful than outdoors. Different species of insects are differently affected by the powder. Some resist its action most effectually, *e. g.*, very hairy caterpillars and especially spiders of all kinds; while others, especially all Hymenoptera, succumb most readily. In no case are the insects killed instantaneously by Pyrethrum. They are rendered perfectly helpless a few minutes after application, but do not die till some time afterward, the period varying from several hours to two or even three days, according to the species. Many insects that have been treated with Pyrethrum show signs of intense pain, while in others the outward symptoms are much less marked. Differences in temperature and other meteorological changes do not appear to have any influence on the effect of Pyrethrum.

Modes of Application.—Pyrethrum can be applied, 1. In dry powder; 2. As a fume; 3. As an alcoholic extract diluted; 4. By simple solution of the powder in water; 5. As a tea or decoction.

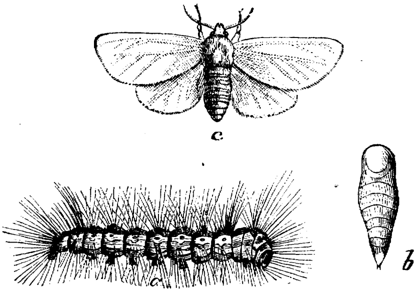
The following recommendations are based on repeated experiments in the field:

1. *Applications of Pyrethrum as dry powder.*—This method is familiar to most housekeepers, the powder being used by means of a small pair of bellows. It is then generally used without diluent, but if it is unadulterated and fresh (which cannot be said, in many instances, of the powder sold at retail by our druggists) it may be considerably diluted with other pulverized material without losing its deadly effect, the use of the powder thus becoming much cheaper. Of the materials which can be used as diluents, common flour seems to be the best, but finely sifted wood-ashes, saw-dust from hard wood, etc.; in short, any light and finely pulverized material which mixes well with the Pyrethrum powder, will answer the purpose. If the mixture is applied immediately after preparation, it is always less efficacious than when left in a perfectly tight vessel for about 24 hours, or longer, before use. This has been proven so far only with the mixture of Pyrethrum with flour, but holds doubtless true also for other diluents. Mr. E. A. Schwarz experimented largely under our direction with the mixture of Pyrethrum and flour for the Cotton Worm, and he found that one part of the powder to 11 parts of flour is sufficient to kill the worms (only a portion of the full-grown worms recovering from the effects of the powder), if the mixture is applied immediately after preparation; but if kept in a tight glass jar for about two days, one part of the powder to 22 parts of flour is sufficient to kill all average-sized worms with which the mixture comes in contact. For very young cotton worms a mixture of one part of Pyrethrum to 30 parts of flour, and applied one day after preparation, proved most effective, hardly any of the worms recovering.

An ordinary powder bellows will answer for insects infesting dwellings or for plants kept in pots in rooms, or single plants in the garden, but it hardly answers on a large scale out-doors, because it works too slowly, the amount of powder discharged cannot be regulated, and there is difficulty in covering all parts of a large plant. Another method of applying the dry powder is to sieve it on to the plants by means of sieves, and this method is no doubt excellent for insects that live on the upper side of the leaves. For large, more shrub-like plants with many branches and for insects that hide on the underside of the leaves this method will be found less serviceable. A very satisfactory way of applying the powder on large plants, in the absence of any suitable machine or contrivance, is to throw it with the hand after the manner of seed-sowing. This method is more economical and rapid than those mentioned above and it has, moreover, the advantage that, if the plants are high enough, the powder can be applied to the underside of the leaves. *(To be continued.)*

THE CATERPILLAR NUISANCE IN CITIES: HOW TO SUPPRESS IT.—In the public interest you have already drawn attention to the numerous caterpillar nests that are now disfiguring the shade trees in most parts of the city. These trees are a marked and beautiful feature of Washington, and our Park Commissioners cannot be too greatly praised for their endeavors to properly care for them and protect them from injury. In this good work they should be aided by all public spirited citizens. I have thought, therefore, that a few suggestions in reference to this caterpillar nuisance would be timely and might do some good.

This Web-worm, known in entomological works as the fall web-worm (*Hyphantria textor*), is one of the most wide-spread and injurious insects in the country, feeding, as it does, on all sorts of trees, and occurring everywhere east of the Rocky mountains. The parent is a white moth, more or less spotted with black, which issues in spring from the cocoon in which the chrysalis has hibernated, generally near, or just below, the surface of the ground, but also in any other sheltered situation. The pale yellow eggs are laid, to the number of 300 and upward, during the last days of May and the earlier part of June, in this latitude, in one uniform batch, slighly interspersed with white hairs from the body of the female. They are not easily noticed, and it is useless to attempt their destruction in a general way. Immediately upon hatching, the young worms feed together on the parenchyma of the leaf, leaving nothing but the epidermis. As they grow they spread from leaf to leaf, enclosing whole branches with their web, and few attempts are made to destroy them until they have rendered themselves conspicuous, and are nearly full-grown as at the present time. At this stage there is no more available way of destroying them than by pruning off the infested twigs and branches, care being taken to subsequently destroy the worms. A wad of cotton, or other material, attached to the end of a long pole, saturated with kerosene or coal tar and ignited will also do good service in burning them. But on all the smaller trees of the city that can be readily reached with a hand pump, there is a much simpler remedy which might be uniformly employed by the Commissioners at trivial expense. With a little practice the first affected leaf or leaves can be detected during the first days of June before the trees shows any disfigurement. If at such time the parts of the tree where the young caterpillars have been noticed be



Hyphantria textor; *a*, larva; *b*, chrysalis *c*, moth (after Riley).

sprinkled with water in which London Purple has been mixed in proportion of about 1 pound of the purple to about 100 gallons of water, the young worms will all be destroyed thereby and no further disfigurement of the tree ensue from them. A second application about the middle of June to the more limited number of worms that hatch from eggs laid after the first application, may also be desirable. The purple can be got at wholesale from Hemingway & Co., New York, at from 6 to 10 cents a pound, and a few dollars' worth would answer for the trees of the whole city. It would pay the Park Commission to have a special tank built and mounted on wheels for this purpose, with a force pump that might be worked with two men, while a third handles the atomizing nozzle through which the poisoned spray should be applied. One of the simplest and most satisfactory nozzles of this kind is made by two converging holes so that the two jets of water break each other as they issue. Important improvements in the mode of atomizing will be published in the next report of the Entomological Commission; but it is not necessary to illustrate them in this connection. A tank for poisoned water, such as I have indicated, would not only prove valuable in protecting the trees from this particular caterpillar, but from most injurious insects that attack them, as, *e. g.*, the imported Elm-leaf beetle, which is so bad on the elms in the grounds of the Department of Agriculture and elsewhere. No better investment can be made by the authorities.

For private gardens and parkings I would recommend one of the ordinary force-pumps, and the Nelson aquæpult will be found particularly satisfactory.—*C. V. Riley, in Washington Evening Star.*

BLEPHAROCERIDÆ.—Mr. J. Q. Adams, of Watertown, N. Y., writes under date of June 28th, that he recently found what, from our description in a late number of the NATURALIST, he recognized as Belpharocerid pupæ. They were in a very cold stream of water in the country back of Watertown, where the water ran over smooth slate rock with numerous falls. They soon died and became foul, however, when transferred to still water. We subsequently succeeded in obtaining specimens in the pupa and imago state and they proved to be genuine Blepharocerids, the species not yet determined.

REMARKABLE CASE OF RETARDED DEVELOPMENT.—Mr. J. D. Graham, of the Kansas State Agricultural College at Manhattan, has sent us for identification the eggs and newly hatched young of a locust which, on examination, proved to be of *Caloptenus spretus*. The facts connected with these eggs and their hatching are so remarkable, that few persons would be willing to credit them were the circumstances not given with care and by a competent observer. He writes: "These eggs were buried in the fall of 1876, and a sidewalk was laid immediately above them. This walk has not been moved since that time, until the eggs were found. The earth which covered the eggs was principally clay, old mortar and bits of stone, though there was some black earth immediately surrounding the eggs."

The eggs were found, it seems, while men were cleaning away an accumulation of spalls, mortar and clay, and the sidewalk above referred to, in the rear of the laboratory. We learn that the eggs were about ten inches below the sidewalk and certainly not deep enough to be entirely out of the influence of the changing temperature of the year. Appearing fresh when dug up they were placed by Mr. Graham under favorable conditions for hatching, and in due time a lively swarm of locusts issued.

We have, in our own experience, in rearing insects, often known of retarded development both in larvæ and pupæ to the second and even the third year; but in this instance we have a well authenticated case of eggs remaining unhatched for nearly 4½ years. The fact that the species is *Caloptenus spretus* (which, to our knowledge, so abounded around Manhattan in the fall of 1876 that the ground all around the college was absolutely full of eggs) is confirmatory of the statement of Mr. Graham, because the species did not occur there nor in that part of the country last fall, nor in fact during any year since 1877. The eggs above referred to must be a retarded remnant of those which were so thickly laid there in the fall of 1876 and which gave birth to the destructive multitudes of young locusts the ensuing spring.

PROMOTION OF SILK-CULTURE IN CALIFORNIA.—Mrs. Theodore H. Kittell, corresponding secretary of the California Silk-culture Association, San Francisco, Cal., writes: "We have, through our efforts, succeeded in convincing our people of the practicability of home silk culture, and by lectures, distribution of pamphlets, mulberry seeds, slips and silkworm eggs we have now so animated the public that complete success seems certain, if we shall be able to start a filature for the reeling of the silk produced. Our society takes the liberty of asking you as one of the most urgent workers for silk-culture in America to give us your advice as to a filature, and the best and cheapest mode of preparing the fiber for the market."

We would refer for our opinions on the subjects mentioned to our "Manual of Instructions for the production of Silk," which can be obtained, upon application, of the Commissioner of Agriculture.

LOCUST FLIGHTS IN DAKOTA.—Mr. Geo. W. Hart of Columbia, Brown Co., Dakota, reports that a flight of locusts (*Caloptenus spretus*) passed over that place from 11.30 A. M. to 3.30 P. M. on the 7th of July, coming from S.S.E., the wind being strong and the weather dry. On July 16th, another correspondent, Mr. F.

C. Kelley, of Jamestown, Dakota Ter., reports a flight as passing over that place without giving the direction of the flight. Large numbers of the common dragon-fly, *Diplax rubicundula* Say, were mingled with the locusts.

THE HESSIAN FLY.—In many parts of Central and Southern Illinois and in Missouri this insect has been reported as doing considerable damage, many farmers having to plow up their winter wheat in consequence. Mr. Thomas H. B. Moulder, of Cane Pump, Camden Co., Mo., sent the insect in the flax-seed state, the latter part of June, with the statement that he had forty acres of wheat which all fell or broke down about two weeks before ripening, from the insect's injuries. The western agricultural papers have had abundant notices of the Hessian Fly this season, but as our eastern entomologists, as a rule, do not see those journals, it is more than probable that this year would be put down by them as one in which the species was not heard of or known. The present year is, however, not exceptional, and more or less injury has been done by this insect in the West every year since we have given any attention to entomology.

THE GENUINE ARMY WORM IN THE WEST.—While the reports of the appearance of the army worm in New York, noticed in the July number of the NATURALIST, proved to be, as there stated, due to the injuries from *Nephelodes violans* and a supposed Pyralid larva,[1] the true army worm has since appeared in force in Central Illinois and adjacent parts of Indiana, doing much injury during the latter part of July, especially to oats. It has also been reported from Wisconsin and Michigan, but investigation indicates that in those two States other insects have been mistaken for the army worm. There is no question, however, about those in Illinois and Indiana, as we have received specimens from different correspondents, and have had the matter investigated by Mr. L. O. Howard, of the Department of Agriculture. From the facts which he gathered, it would seem that the autumn of last year was rather dry in the region devastated and that this spring was an average and favorable one, being neither unusually wet nor dry. It becomes very evident that the eggs were laid the present year, either by the moths that had hibernated or by a second generation of moths, the latter seeming, from all the facts gathered, most probable.

A NEW IMPORTED ENEMY TO CLOVER.—Again we have to report the sudden appearance in this country of an insect which, though well known in Europe for almost a century, was never known to do any serious harm there to crops. We refer to *Phytonomus punctatus* Fabr., a member of the Curculionid family, which every one who has traveled in Europe, and has paid any attention to insects, will doubtless have met with under stones, sticks, etc., in pastures and meadows. Mr. L. D. Snook of Barrington, Yates Co., N. Y., sent us during the latter part of July a number of specimens of this beetle, with the statement that it greatly injures clover on his farm. Further particulars as to the nature of the damage have not yet been received. It is worthy of remark, that this imported enemy to clover made its first appearance in the same county from which, three years ago, we first reported another European beetle affecting the same plant, viz., the clover root-borer (*Hylesinus trifolii* Müll).

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[1] We have since bred the moth from this larva and it proves to be *Crambus vulgivagellus* Clem (= *chalybirostris* Zell). Professor Lintner had previously bred a specimen of what he considered *Crambus exsiccatus*. Both are common species of the genus.

ANOTHER ENEMY OF THE RICE PLANT.—To the enemies of the rice plant already mentioned and discussed by us elsewhere, viz., *Chalepus trachypygus* and *Lissorhoptus simplex*, we have now to add a third one, and this time of the Order Lepidoptera. It is the larva of *Laphygma frugiperda*, well-known to be destructive to most grasses and grains. Rice suffered greatly from it this summer in Georgia, and we determined the species from specimens sent us by Mr. W. Barnwell, of Savannah.

CANKER WORMS.—One of the next striking examples of devastation by the spring canker worm (*Paleacrita vernata*) which has ever come to our knowledge, is that to the orchards of Mr. J. W. Robeson, of Taswell Co., Ill., which were this year so seriously affected as to be nearly killed and ruined.

LEPIDOPTEROLOGICAL NOTES.[1]—*Ægeria acerni* Clem. (Rep. VI, p. 110).—Mr. D. S. Kellicott has an interesting article in the *Canadian Entomologist* for January, 1881, on the Ægerians inhabiting the vicinity of Buffalo, N. Y., in which he states that the chrysalis of this species in his locality, does not agree with my description as "unarmed," if that description refers to the dorso-abdominal teeth. A re-examination of my specimens shows that my statement applies to the absence of these teeth. It is, however, possible that there is some variation in this regard, and that the eastern specimens from the hard maple differ from the western ones from the soft maple in having the teeth, as indicated by Mr. Kellicott.

Hyphantria textor Harr. (Rep. III, 130).—There is no doubt in my mind, from frequent breeding of specimens, that this is synonymous with *cunea* Drury, and *punctata* Fitch, which are but varieties, Drury's name having priority.

Callimorpha fulvicosta Clem. (Rep. III, 132).—Grote and Robinson give the synonymy of this species in their "List of Lepidoptera of N. A.," etc., *lecontei* Boisd., having priority. The late Jacob Boll bred all the forms from larvæ feeding on the same plant.

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[1] From advance sheets of Bulletin VI, U. S. Entomological Commission, by C. V. Riley, being a general index and supplement to the nine Reports on the Insects of Missouri.

Samia columbia Smith (Rep. IV, p. 107).—Mr. Herman Strecker has given a beautiful figure of the male of this species in his "Lepidoptera Rhopaloceres and Heteroceres," etc., 1875 (Pl. XII, Fig. 3), and Mr. F. B. Caulfield has described and figured the larva (*Canadian Entomologist*, X, p. 41, 1878), showing that it is structurally identical with that of *cecropia*, and differs only in the intenser green of the body, in the lateral tubercles and bases of the others being white instead of pale blue, and in the upper thoracic tubercles being of a deeper coral red. It accords more with the *cecropia* larva in the fourth stage. It is placed as a good specimen in Grote's "List of N. A. Platypterices," etc. (Am. Phil. Soc., 1874), but I am still of opinion that it should not be considered a distinct species, but simply a well-marked local color variety worthy of name. There is great variation in color, whether of the larva, cocoon or imago, in *cecropia.*

Callosamia angulifera Walker (Rep. IV, p. 122, note).—This is still considered a good species by systematists. Mr. Akhurst finds that it is rather constant from larvæ which seem to differ in no respect from those of *promethea*, but which feed on the tulip tree (*Liriodendron tulipifera*), and make the cocoon near the ground without pedicel.

Celæna renigera Stephens (Rep. I, p. 86).—Referred by Grote to Hadena. Specimens in the Fitch collection marked with names evidently from Walker, *infecta, egens, defectua, subcadens?* and *murcimaculata* seem to be all synonyms and mere variations.

Prodenia autumnalis Riley (Rep. III, p. 116 and subsequently).—As stated in the eighth report (p. 48) this in the more typical form is recognized as *Laphygma frugiperda* Sm. and Abb. The variety *obscura*, as Professor Zeller, who has seen it, informs me, is so near the European *exigua* Hübn., that it is not easily distinguished.

ANTHROPOLOGY.[1]

THE SACRIFICIAL STONE OF THE CITY OF MEXICO, IS IT GENUINE OR NOT?—In the city of Mexico are offered for sale, casts in plaster of the so-called sacrificial stone now in the courtyard of the museum in the city of Mexico, of which much has been written to prove its genuineness. These casts are much reduced in size, and do not contain the groove of the original. The maker, like many of his countrymen living in the city of Mexico, may not believe in the genuineness of this stone's history; many assert that it was not the sacrificial stone of the Aztecs used in the city of Mexico. No doubt the basin in the center, and groove running from it across the top and down the sides were made after the ornamentation was completed. As this is claimed to represent the journeying of the Aztecs to the city of Mexico, why did they not cut the groove first, then the historical representation?

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[1] Edited by Prof. OTIS T. MASON, 1305 Q Street, N. W., Washington, D. C.